SECRET

50C38

NPIC/TSG/RED/SDB-053-70
20 November 1970

MEMORANDUM FOR THE RECORD

SUBJECT: Status Report on the [redacted] Production of 1540 Light Tables 25X1

1. At present, this project is in the phase of pre-acceptance testing of the first article production light table. Two visits have been made to [redacted] 25X1 for the purpose of preacceptance testing. The first visit took place from 28 October to 2 November 1970; the second, 11-13 November 1970.

2. On 5-8 October 1970 [redacted] was visited to review progress of the project. At that time tangible progress was limited to layouts and drawings, quantities of hardware received from suppliers, and wiring harness subassemblies. Delivery of the tables was scheduled to begin the last week in October, and [redacted] was queried as to when they would be ready for preacceptance testing. [redacted] was also advised that they should have completed their own acceptance test procedure (ATP) and be satisfied with the results before inviting government personnel to review and test the first article. 25X1 25X1 25X1

3. Several contacts were made with [redacted] personnel in October, during which they were asked when the table would be ready for government ATP and again prompting that [redacted] should perform their own ATP before a government visit. Finally, [redacted] advised that they were ready for a visit on 28 October and had performed their own ATP. Representatives of IEG, IAS, DIAAP-9, ESD, and RED travelled to [redacted] on 28 October. After arrival, the ATP was successively put off a few hours on the 29th, until the next day on the 30th, and finally until the afternoon of the 31st. The immediate question on arrival that afternoon at [redacted] was, "Is the table ready?" Answer: "Yes." Question: "Did you perform a complete ATP satisfactorily?" Answer: "Well--partially." It was subsequently discovered that [redacted] had finished assembling the table only an hour before our arrival, a very minimum of testing had been performed, and [redacted] and the government was going through the ATP together for the first time. [redacted] admitted they had taken a calculated risk in inviting our presence--and lost. 25X1 25X1 25X1 25X1 25X1 25X1 25X1 25X1 25X1

SECRET

SUBJECT: Status Report on the [redacted] Production of 1540 Light Tables 25X1

4. The ATP performance on 31 October uncovered major faults in the optics carriage motion and drive, excessive noise in the elevating and tilt mechanisms, and improper tracking of 70mm film. Several minor faults were discovered such as improper and inconvenient operation of cover locks, inconvenient optics mount lock screws, and glass viewing surfaces not parallel. That evening the list of problems was reviewed and discussed. Again, [redacted] was advised to complete 25X1 the table and perform their own ATP satisfactorily before inviting the return of government personnel.

5. In the interim between visits, several contacts were made with [redacted] to determine progress and their readiness for 25X1 a second visit. [redacted] was advised that the contract monitor 25X1 was to precede any other government personnel so as to predetermine readiness for testing. Again, [redacted] was advised to 25X1 complete their own ATP.

6. The contract monitor was advised of readiness for a second visit on 11 November. On that date the table substantially met the requirements of the ATP, but in certain major subjective aspects it was marginal or unsatisfactory. Freedom of movement of the optics carriage in the Y direction and excessive lost motion and looseness in the motorized drive for the carriage Y direction were unsatisfactory. Several of the minor faults discovered during the previous visit had been uncorrected. The discrepancies were discussed with [redacted] personnel, and [redacted] requested that the PI's be brought 25X1 out so that they could discuss some of the more subjective aspects with them.

7. On 12-13 November the table was subjected to a careful and thorough ATP and operational evaluation. It was confirmed that the optics carriage Y-drive and motion was unsatisfactory. Furthermore, the optics mount tended to drift downward from an original position after a weight had been placed on the mount, and the optics mount would not translate low enough so as to allow focus by the [redacted] Measuring Macroscope. 25X1 The Y direction carriage motion had too much backlash or lost motion when locked up and supposedly immobilized; the backlash tended to increase with use. Also, it was determined that the translation speed of the optics mount was different in the X and Y directions. All faults discovered, both major and minor, were discussed with [redacted] 25X1

SUBJECT: Status Report on the [redacted] Production of 1540 Light Tables 25X1

8. Problems with parts and component suppliers were surfaced that indicated a real problem with the delivery schedule. These problems seemed to indicate a slippage in delivery even though [redacted] was still saying they would be on schedule or very close to it. As of 13 November, only seven tables were in varying stages of assembly and waiting for the delivery of necessary parts. However, many stands were assembled and many subassemblies ready. 25X1

Specifically, a supplier of film drive castings and idler bracket die castings in [redacted] is not producing according to expectations or promises. Forty of the film drive castings are expected to be completed by 16 November with shipment on 25 November. This is sufficient for ten tables only, and it is expected to be a critical item. Default here will force [redacted] to resort to sand castings, which can be produced rather quickly, but at extra cost. 25X1 25X1

As another example, the supplier of the optics ring mount, a machined part, produced some 450 of these items. Of these, about 37 were acceptable and 413 unacceptable. The supplier cancelled out because he was losing too much money. [redacted] must now resort to their second source of supply. Production rate of these parts could be something like 150 per week beginning in two or three weeks. Thirty-seven of these parts supply a like number of tables. If these parts are not supplied in quantity by 1 December, a very serious problem results and the schedule of 145 tables by early January 1971 cannot be met. 25X1

In addition to these two citations, there were at least four other supplier problems of similar or less seriousness.

9. With respect to the contractual requirement of 145 tables by early January, the following conjectural delivery schedules should be considered:

	November		December			
Week Beginning	22	29	6	13	20	27
Tables Delivered	5	21	29	30	30	30
		5	20	33	43	43

SUBJECT: Status Report on the [redacted] Production of 1540 Light Tables 25X1

It is apparent that unless sufficient quantities of all parts are delivered before the week beginning 29 November, delivery of the required number of tables becomes very questionable. Indeed, producing 43 or 44 tables per week is very questionable. However, when suppliers start producing as promised, assembly and production of the tables will probably proceed at a surprising rate.

10. On 17 November a telephone conversation with [redacted] 25X1 indicated that several of the minor faults had been corrected with most other corrections to be completed by 21 November. Three major problems exist: (a) the downward drift of the focus mechanism, (b) the difference between the optics carriage X and Y motion speeds, and (c) the backlash or lost motion in the optics carriage Y drive. With respect to (a), [redacted] 25X1 is looking at the sprag clutch that is supposed to lock the focus mount in position. Replacing this clutch may cause a supply problem. The second problem, (b) above, is considered to be a change-in-scope. [redacted] 25X1 feels that the present motions are in spec. To make X and Y speeds equal will require redesign so as to provide separate feedback systems for both X and Y. Design cost for this modification is estimated to [redacted] 25X1 Cost to include the modification in the tables is estimated to be [redacted] 25X1 per table. With respect to (c) above, [redacted] 25X1 feels that this is a clutch problem in that the clutch was initially out of backlash tolerance and loosens up with use. The manufacturer of the clutches has been contacted and believes they have a fix. However, delivery and installation of a new clutch is expected to take at least a week and probably more. This also will probably affect the delivery schedule.

[redacted] 25X1

Project Monitor

Distribution:
Original - Route & File
1 - Contract File
1 - SDB/RED/TSG/NPIC

Secret

Exec/Dir, NPIC

John -

With regard to the differential x & y drive speeds, we suspect that it still may be sufficiently close as to be IEG acceptable. If not, we have alternatives: Retrofit later, or use another engineering approach suggested by Nick.

While the basic issue of delivery schedule is in doubt, I still believe we're getting the best table for our money, and with no more development pain than we would have incurred from another manufacturer

[redacted]

11/25/70

CENTER ROUTING SLIP

FROM: RED/TSG

DATE: 25 NOV 1970

TO		INITIALS	DATE
DIRECTOR			
DEP/DIRECTOR			
EXEC/DIRECTOR	3	[illegible]	11/30
SPECIAL ASST	2	M	12/4
ASST TO DIR			
HISTORIAN			
CH/PPBS			
DEP CH/PPBS			
EXO/PPBS			
CH/SS			
DEP CH/SS			
SC & P			
RECORDS MGT			
PERSONNEL			
LOGISTICS			
TRAINING			
SECURITY		See p. 7,	
FINANCE		para 2.	
CH/IEG			
DEP CH/IEG			
EXO/IEG			
CH/PSG			
DEP CH PSG			
EXO PSG			
CH/TSG	4	[illegible]	11/25
DEP CH/TSG			
EXO/TSG			
DIR/IAS/DDI			
CH/DIAXX-4			
CH/DIAAP-9			
CH/SPAD			

REMARKS

I believe the majority of this information was conveyed during our discussions, but this chronology should help put things in perspective.

As of today [redacted] asserts that they have corrected all the faults & the table should be ready this weekend. The only item they didn't correct was the constant x and y axis speed at any pot setting. This feature they consider a change-in-scope. During the pre-acceptance the IEG and DIA rep will be asked to rule on the acceptance of this feature.

[redacted] will leave for the west coast 27 Nov to verify their fixes & then will ask the rest of the acceptance team to come if appropriate.

Discussions with [redacted] [redacted] have been held on contract implications [redacted]

IP FORM 30 (7 70) OBSOLETE PREVIOUS EDITIONS

TRANSMITTAL SLIP	DATE 12/8
TO: C/RED WH	
ROOM NO.	BUILDING
REMARKS: For your records – Betty – FI/C	
FROM: JWC	
ROOM NO.	BUILDING / EXTENSION

FORM NO 1 FEB 55 241 REPLACES FORM 36-8 WHICH MAY BE USED. (47)

(3) Many other recommendations have not yet been incorporated into the table. The manufacturer indicated that was due to the lack of time as the major redesign of the optics mount assembly and Y motion carriage lock had required the majority of the time available. However, the manufacturer indicated that these deficiencies, along with several noted during this inspection would be corrected. To assure that this would be accomplished the procurement contract calls for an extensive inspection of the first production run light table at the manufacturer's plant. The uncorrected deficiencies are:

(a) Many wires remain exposed to the operator, presenting an electrical shock hazard.

(b) No emergency hand cranks available to move film in case of power failure.

(c) The protective cover under the light sources must be opened to utilize the table in the split vertical mode.

(d) The casters are wobbly and difficult to lock.

(e) Sharp edges on the control boxes adjacent to the operator's knees.

(f) A lack of film loading diagrams and motor drive directional diagrams.

(g) Loose light tube sockets allowing the light tubes to vibrate free.

(h) The motor drive for the overhead carriage produces significantly different translation speeds in X and Y direction at the same speed setting.

(i) The film spindle support arms are difficult to adjust for different width film.

(j) Operator cannot adjust table elevation or degree of tilt while in normal operating position.

(k) At brightest setting the light source did not equal stated specifications.

(l) No means of preventing accidental movement of the optics mount in the X direction.

(m) Repeated failure of the motor drive for elevating and tilting the table.

[redacted] ILLEG
ILLEG

WORK DATA
NAME U.V. Exposure Criteria
DATE 10/4/70

4.1.1.2 Spectral Composition

Information concerning the selection of illuminant color is presented in Table 4.1-1. Early speculations suggested that monochromatic illumination would be superior because of reduced effects of chromatic aberrations. Experimental evidence available to date indicates that difficulties in achieving compatibility with other tasks and lighting requirements probably outweigh the limited advantages found. In special situations, e.g., long duration mensuration without intervening tasks, red or green light may prove superior. Blue light should not be used without appropriate refractive correction (-1 diopter).

Although clear effects of spectral distribution on performance have not been demonstrated, limits at the extreme wavelengths are set by physiological effects. Ultraviolet radiation is absorbed by the lens of the eye and can result in fluorescence of the lens, and the rods in the retina lose sensitivity upon exposure to wavelengths below 380 nm, (Wolf, 1949). Physical damage to the cornea of the eye can result from excessive exposure to ultraviolet radiation. Sensitivity to damage is greatest at approximately 270 nm. Below 210 nm and above 320 nm the effect is zero. The effects of repeated exposures are cumulative and one near-threshold exposure will sensitize the eye to future exposures for at least two weeks (Verhoeff, 1916). Single exposures just below the damage threshold have been reported to reduce visual acuity for several hours.

On the basis of tests with human subjects, Pitts and Tredici (1970) give the damage threshold of the human eye as 0.052×10^6 ergs/cm^2 for 280 nm. Based on experiments with primates, these same authors provide the relative efficiencies for damage production in ten nanometer wavebands for radiation from 205 nm to 325 nm. These values are shown in the following table:

WORK DATA
NAME U.V. Exposure Criteria
DATE 10/4/70

WAVEBAND nm	PRIMATE RELATIVE EFFICIENCY (W_λ)
205-215	0.012
215-225	0.19
225-235	0.18
235-245	0.33
245-255	0.20
255-265	0.36
265-275	1.00
275-285	0.67
285-295	0.57
295-305	0.36
305-315	0.20
315-325	0.011

TABLE 4.1-1A RELATIVE EFFICIENCIES OF 10 NANOMETER WAVEBANDS OF ULTRAVIOLET RADIATION TO PRODUCE CORNEAL DAMAGE
(From Pitts and Tredici, 1970)

To calculate the exposure time required to reach the damage threshold, the following formula can be used:

$$T_{(sec)} = \frac{.0348 \times 10^6 \text{ ergs/cm}^2}{\sum_{\lambda = 205}^{\lambda = 325} H_\lambda W_\lambda T_\lambda}$$

where H_λ = The irradiance of the source for a given 10 nm waveband expressed in ergs/cm^2/sec.

W_λ = The relative efficiency of that waveband from Table 4.1-1A

T_λ = The transmittance for that waveband of any viewing device, expressed in decimal form, placed between the source and the observer's eye.

WORK DATA
NAME Z/I Exposure Criteria
DATE 10/4/70

The daily exposure time should not exceed 1/6 of the value calculated. If this limit is expected to be exceeded in normal use of a device, damage may result from the cumulative effects of the exposure, and steps should be taken to reduce the ultraviolet irradiance of the device, or to provide the observer with protective viewing equipment.

Heating effects from infrared radiation can produce discomfort and ultimate tissue damage. This problem is especially critical where significant levels of air movement tend to dry up the eyes. Damage threshold is about 0.3 watts/cm^2 on the skin (Webb Associates, 1962). Excessive discomfort including sweating will occur at levels above 0.025 watts/cm. (Illuminating Engineering Society, 1966).

CHART PARAGRAPH

Ultraviolet radiation below 380 nm should be eliminated if possible. In no case should the expected daily use of equipment expose the operator to more than 1/6 the threshold value calculated from the formula in paragraph 4.1.1.2.